(19)日本国特許庁（ＪＰ）　(12) **公開特許公報（Ａ）**　(11)特許出願公開番号

特開平5－325134

(43)公開日　平成５年(1993)12月10日

(51)Int.Cl.[5]	識別記号	庁内整理番号	ＦＩ	技術表示箇所
Ｇ１１Ｂ　5/31		Ａ　7247－5D		

審査請求　未請求　請求項の数１(全　5　頁)

(21)出願番号　特願平4－136879

(22)出願日　平成４年(1992)５月28日

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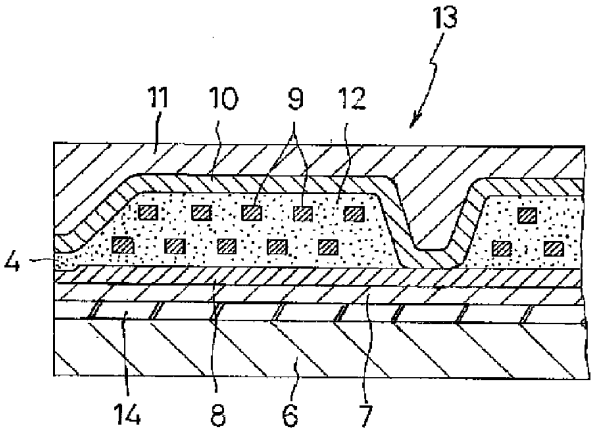
(54)【発明の名称】　薄膜磁気ヘッド

(57)【要約】

【目的】　最適な磁気特性を保持させた状態で、ウイグルノイズの発生および磁性層の剥離を防止し品質の安定した薄膜磁気ヘッドを提供する。

【構成】　基体６上に紫外光、可視光、赤外光の少なくとも一つの光が透過する絶縁層７を形成し、前記絶縁層７の上に磁性層８を成膜してなる薄膜磁気ヘッド１３において、前記基体６と絶縁層７との間に金属膜１４が形成されていることを特徴とする。



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【特許請求の範囲】

【請求項１】　基体上に紫外光、可視光、赤外光の少なくとも一つの光が透過する絶縁層を形成し、前記絶縁層の上に磁性層を成膜してなる薄膜磁気ヘッドにおいて、前記基体と絶縁層との間に金属膜が形成されていることを特徴とする薄膜磁気ヘッド。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】本発明は、磁気ディスク等の磁気記録媒体に対して相対移動しながら情報の記録・再生・消去等を行う薄膜磁気ヘッドに関する。

【０００２】

【従来の技術】一般に、従来の薄膜磁気ヘッド１は、図４に示すように、セラミックス製の平面形状がほぼ矩形のスライダ２のトレーリング側端部に、薄膜ヘッド素子３をそのギャップ４をＡＢＳ面５に開口させるようにして設けて形成されている。

【０００３】この薄膜ヘッド素子３は、図５に示すように、Ａｌ２Ｏ３Ｔｉ Ｃ系のセラミックス製の基体６の上に、スパッタリング法等の薄膜形成法により、絶縁層７、下部磁性層８、巻線９、上部磁性層１０、保護層１１を順に積層して形成される。下部磁性層８および上部磁性層１０を形成する素材はともにパーマロイであり、巻線９の素材は銅であり、この巻線９が配設されている両磁性層８，１０の対向部分には樹脂等の絶縁部材１１が充填されている。両磁性層８，１０は一部が連結されているとともに、先端部がギャップ４を介して対向しており、巻線９は前記両磁性層８，１０の連結部を周回するようにして形成されている。また、絶縁層７および保護層１１はＡｌ２Ｏ３等によって形成されている。

【０００４】また、前記基体６の素材としては、前述したＡｌＴｉＣ系等のセラミックス素材の他に、ガラス、ＳｉＯ２、Ａｌ２Ｏ３、各種フェライト、各種セラミックス等の多岐にわたる素材が用いられている。そして、特に、ＡｌＴｉＣ系等のセラミックス素材を基体６として、この基体６の上に下部磁性層８を成膜する場合には、前述したように、基体６の上に直接的に下部磁性層８を成膜するのでなく、ＳｉＯ２、Ａｌ２Ｏ３等の絶縁層７を下地膜として基体６の上に設け、この絶縁層７の上にスパッタリング法等の薄膜形成法によりパーマロイ等の下部磁性層８を成膜させることが一般的に行われている。

【０００５】また、従来の薄膜磁気ヘッド１の下部磁性層８の薄膜形成時には、基体６を約３００℃程度に加温して行う。これは、薄膜磁気ヘッド１としての磁気特性を最適化させるためである。

【０００６】また、薄膜ヘッド素子３は生産性の向上と経済的負担の低減とが考慮されて、個別に製されるのでなく、例えば３インチのウエハ状の大きな基体６に、多数の薄膜ヘッド素子３を同時に形成し、適宜な切断装置

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により切り出されている。

【０００７】このように形成されている薄膜磁気ヘッド１においては、記録時には、巻線９に通電することにより、前記ギャップ４部分に磁束を発生させて磁気記録媒体に対して情報の記録を行ない、再生時には、磁気記録媒体の磁束を巻線９に鎖交させることにより情報の再生を行なう。

【０００８】

【発明が解決しようとする課題】しかしながら、前述したセラミックス素材を基体６として用いた従来の薄膜磁気ヘッド１においては、スパッタリング法による薄膜形成時に基体６を約３００℃に加温することにより、薄膜ヘッド素子２の下部磁性層８に、例えば５００ＭＰａ程度の大きい応力が生じ、下部磁性層８の剥離および薄膜ヘッド素子２の変形が発生し、品質が安定しないという問題点があった。

【０００９】また、薄膜ヘッド素子２に働く応力は薄膜ヘッド素子２の異方性軸方向のばらつきを増加させるとともに、磁化させたときに逆磁歪効果によって異方性軸方向のばらつきがより増加し、薄膜磁気ヘッド１とした場合の出力特性を低下させ、さらにウイグルノイズが発生して安定した品質が得られないという問題点があった。

【００１０】また、絶縁層７として透明なＡｌ２Ｏ３等を用いると、その絶縁層７を通して基体６の熱エネルギが輻射によって放出されてしまい、基体６の昇温速度が小さくなり、薄膜形成に長時間を要するとともに、生産効率が低下するという問題点があった。

【００１１】本発明はこれらの点に鑑みてなされたものであり、前述した従来のものにおける問題点を克服し、最適な磁気特性を保持させた状態で、ウイグルノイズの発生および磁性層の剥離を防止し品質の安定した薄膜磁気ヘッドを提供することを目的とする。

【００１２】

【課題を解決するための手段】前述した目的を達成するため本発明の薄膜磁気ヘッドは、基体上に紫外光、可視光、赤外光の少なくとも一つの光が透過する絶縁層を形成し、前記絶縁層の上に磁性層を成膜してなる薄膜磁気ヘッドにおいて、前記基体と絶縁層との間に金属膜が形成されていることを特徴としている。

【００１３】

【作用】前述した構成からなる本発明の薄膜磁気ヘッドによれば、基体と絶縁層との間に形成した金属膜に熱エネルギの蓄熱と熱の輻射の防止とをさせることができるので、スパッタリング法による下部磁性層の薄膜形成時に基体に付与する温度を低温とした状態で最適の磁気特性をえることができ、薄膜磁気ヘッドの応力を減少させ、下部磁性層の剥離、ウイグルノイズの発生等の不都合を確実に除去することができる。

【００１４】

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【実施例】以下、本発明の実施例を図１から図３について説明する。

【００１５】図１は本発明の薄膜磁気ヘッドの一実施例の要部を示し、前述した従来例と同一部分には同一符号を付してある。

【００１６】本実施例の薄膜磁気ヘッド１３においては、基体６の絶縁層７側の表面に銅素材からなる金属膜１４を介在させて形成されており、その他の構成は従来と同一である。

【００１７】更に説明すると、ＡｌＴｉＣ系のセラミックス素材からなるウエハ状の基体６の少なくとも一方の表面に、鍍金、電着あるいはスパッタリング等の公知の薄膜形成法により銅素材を厚み０．１μｍ程度の金属光沢を有する金属膜１４として形成する。その後に、Al_2O_3 を素材とした絶縁層７等が従来と同様にして形成される。

【００１８】なお、金属膜１４としては、下部磁性層８の成膜時において、基体６の昇温中に基体６から下部磁性層８の形成側表面への熱の輻射を防止することができ、所定温度へ昇温させた基体６の温度保持特性のよい金属素材であればよく、例えばＡｕ、Ｔｉ、Ｎｂ、Ｃｒ等の金属素材でもよく、特に、本実施例に限定されるものではない。また、金属膜１４の厚さは、少なくとも均一な金属光沢を有する程度とすることが望ましい。これは薄すぎると金属膜１４がポーラスとなり、厚すぎると絶縁層７との付着性が劣化する等の種々の問題が生じるからである。

【００１９】そして、絶縁層７の表面に下部磁性層８をスパッタリング等の薄膜形成法を用いて、成膜中の基体６の温度を従来より低温、例えば約２５０℃として成膜させる。

【００２０】このようにして形成されている本実施例の薄膜磁気ヘッド１３の作用および各種の特性を図２および図３について説明する。

【００２１】まず、前述した構成からなる本実施例の薄膜磁気ヘッド１３によれば、スパッタリング等の薄膜形成法により、下部磁性層８を形成する場合において、基体６の昇温時に金属膜１４は熱エネルギを蓄熱することができるとともに、基体６の下部磁性層８の形成側表面から輻射される熱エネルギを減少させ、基体６の昇温時間を短縮させることができる。そして、成膜中の基体６の温度を従来より低温、例えば２５０℃とした場合において、絶縁層７の表面に形成される下部磁性層８の初期成長層に対して金属膜１４側から熱エネルギが間断なく迅速に供給され、薄膜磁気ヘッド１３に好適な磁気特性を有する下部磁性層８を成膜させることができる。

【００２２】また、基体６の加熱温度を従来（３００℃）より低温（２５０℃）とすることができるので、薄膜ヘッド素子３の下部磁性層８に残留する応力を従来（５００ＭＰａ）の約１／３～１／２程度に低下させることができる。この下部磁性層８の応力が低下すると、下部磁性層８の剥離および薄膜ヘッド素子３の変形を防止することができるとともに、薄膜ヘッド素子３の応力と逆磁歪効果とに起因する異方性軸方向のばらつきを低減させ、ウイグルノイズの発生を防止することができる。

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【００２３】図２は基体６をＡｌＴｉＣセラミックス素材、絶縁層７をAl_2O_3 素材としたときの薄膜磁気ヘッド１３の下部磁性層８の磁気特性（磁界と磁束密度との関係）を示す磁気ヒステリシス曲線であり、図中実線は下部磁性層８の製作時の基体６の温度を２５０℃としたときの銅素材を用いた金属膜１４を有する本実施例の薄膜磁気ヘッド１３の下部磁性層８、図中鎖線は比較のため本実施例の薄膜磁気ヘッド１３の製作時にウエハ状の基体６の一部に金属膜１４を形成せずに本実施例と同一条件で作成した、金属膜１４を有しないダミー薄膜磁気ヘッド１３ａの下部磁性層８、図中破線は下部磁性層８の作成時の基体６の温度を摂氏３００度とした金属膜１４を有しない従来の薄膜磁気ヘッド１の下部磁性層８を示している。

【００２４】この図２より、金属膜１４を有する本実施例の薄膜磁気ヘッド１３は、下部磁性層８の成膜時の基体６の温度を従来より低温とした場合においても、従来の薄膜磁気ヘッド１と同様の磁気特性を保持できることが判明した。また、金属膜１４を有しないダミー薄膜磁気ヘッド１３ａは下部磁性層８の成膜時の基体６の温度を従来より低温とすると、磁気特性が劣悪になることが判明した。

【００２５】図３は薄膜磁気ヘッドの出力特性を示す線図であり、（ａ）は本実施例の金属膜１４を有する薄膜磁気ヘッド１３の出力特性を示す線図であり、（ｂ）は金属膜１４を有しない従来の薄膜磁気ヘッド１の出力特性を示す線図である。

【００２６】図３（ａ）と図３（ｂ）とを比較すると、図３（ａ）に示すように、金属膜１４を有する本実施例の薄膜磁気ヘッド１３は、下部磁性層８の作成時の基体６の温度を従来より低温とした場合においても、ウイグルノイズの発生が皆無（試料２０個中０個）で高品質の薄膜磁気ヘッドであることが判明した。これに対して図３（ｂ）に示すように、金属膜１４を有しない従来の薄膜磁気ヘッド１は、図中矢印で示すようなウイグルノイズが発生する（試料２０個中２個）ことが判明した。また、下部磁性層８の成膜時の基体６の温度を従来より低温とした金属膜１４を有しないダミー薄膜磁気ヘッド１３ａにおいては、前記ウイグルノイズが、従来の薄膜磁気ヘッド１より更に多く（試料２０個中１２個）発生する。

【００２７】このように、基体６とAl_2O_3 等の透明な絶縁層７との間に金属層１４を介在させることにより、磁気特性を最適状態に保持した状態で、下部磁性層

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８の成膜時の基体６の温度を従来より低温とすることができるとともに、ウイグルノイズを除去した高品質の磁気ヘッドを安定して得ることができる。

【００２８】また、下部磁性層８の成膜時における基体６の温度を従来より低温とし、さらに、金属膜１４による基体６からの熱エネルギ等の輻射防止効果により、基体６の昇降温時間を含めた成膜時間を従来に比べて短縮することができ、生産効率を向上させることができる。

【００２９】なお、本発明は前記実施例に限定されるものではなく、必要に応じて変更することができる。

【００３０】

【発明の効果】以上説明したように本発明の薄膜磁気ヘッドは構成され作用するものであるから、下部磁性層の剥離および薄膜ヘッド素子の変形並びにウイグルノイズの発生を確実に防止することができるとともに、高品質で信頼性の優れた薄膜磁気ヘッドを得ることができる等の極めて優れた効果を奏する。

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【図面の簡単な説明】

【図１】本発明の薄膜磁気ヘッドの一実施例を示す要部の縦断面図

【図２】磁界と磁束密度との関係の磁気特性を示す磁気ヒステリシス曲線

【図３】ａおよびｂは本発明と従来例とにおける薄膜磁気ヘッドの出力特性を示す線図

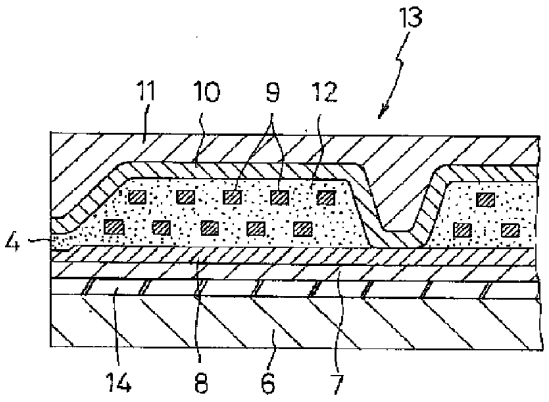
【図４】従来の薄膜磁気ヘッドの全体を示す要部の斜視図

【図５】図４の要部の一部拡大断面図

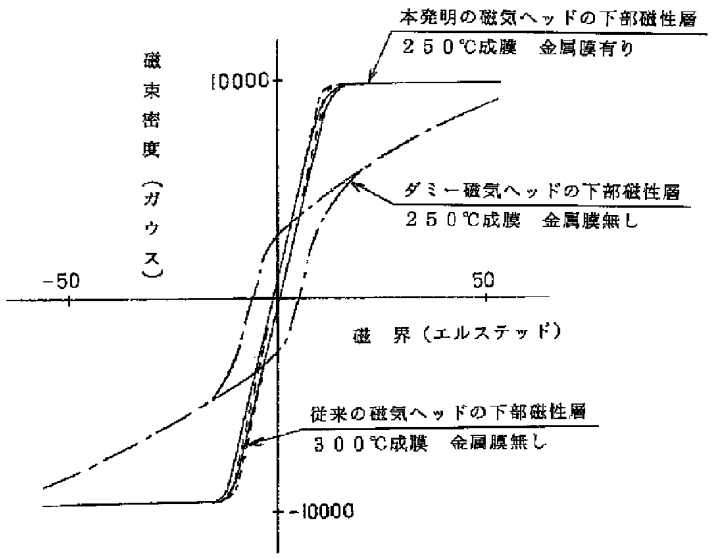
【符号の説明】

６　基体
７　絶縁層
８　下部磁性層
１３　薄膜磁気ヘッド
１４　金属膜

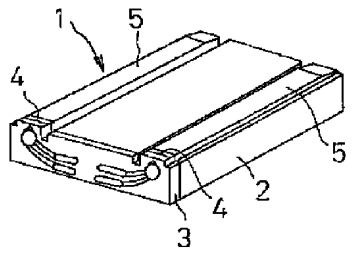
【図１】



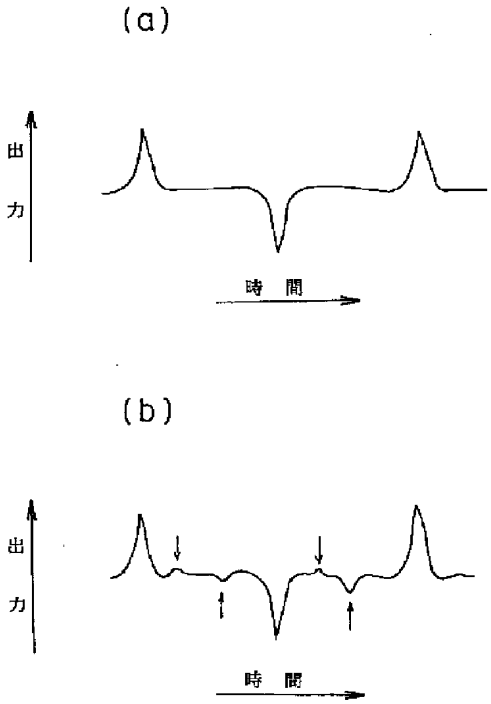
【図２】



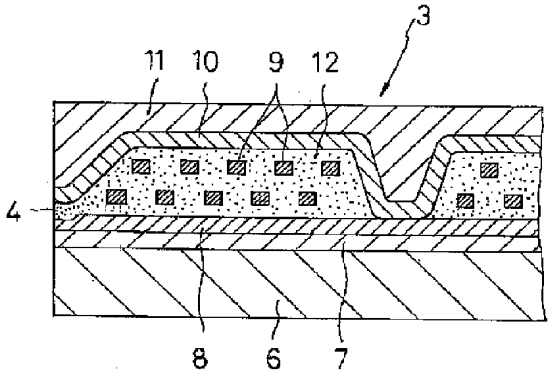
【図４】



【図3】



【図5】



PATENT ABSTRACTS OF JAPAN

(11)Publication number :
05-325134

(43)Date of publication of application :
10.12.1993

(51)Int.Cl.
G11B 5/31

(21)Application number :
04-136879
(71)Applicant :
ALPS ELECTRIC CO LTD
(22)Date of filing :
28.05.1992
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(54) THIN FILM MAGNETIC HEAD

(57)Abstract:
PURPOSE: To provide a thin film magnetic head having a magnetic layer deposited on an insulation layer in which exfoliation of lower magnetic layer, deformation of thin film head element, and occurrence of wiggle noise are prevented positively by forming a metal film between a substrate and the insulation layer.
CONSTITUTION: When the temperature of a substrate 6 is set lower than a conventional level during filming operation, thermal energy is fed quickly and incessantly from a metal film 14 side to the initial growth layer of a lower magnetic layer 8 formed on the surface of an insulation layer 7 thus forming a lower magnetic layer 8 having magnetic characteristics suitable for a thin film magnetic head 13. Furthermore, since heating temperature of the substrate 6 can be set lower than a conventional level, residual stress in the lower magnetic layer 8 of the thin film head element 13 can be released remarkably as compared with a conventional one. Consequently, exfoliation of the magnetic layer 8 and deformation of the element 3 are prevented, fluctuation in the direction of anisotropic axis due to stress in the element 3 or reverse magnetostriction is suppressed, and wiggle noise is prevented.

CLAIMS

[Claim(s)]
[Claim 1]A thin film magnetic head, wherein it forms on a base an insulating layer which at least one light of ultraviolet radiation, visible light, and infrared light penetrates and a metal membrane is formed between said base and an insulating layer in a thin film magnetic head which forms a magnetic layer on said insulating layer.

[Translation done.]
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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application]This invention relates to the thin film magnetic head which performs record, playback, elimination, etc. of information, carrying out relative displacement to magnetic recording media, such as a magnetic disk.
[0002]
[Description of the Prior Art]Generally, the plane shape made from ceramics makes the thin film head element 3 the trailing side edge part of the rectangular slider 2, and makes ABS surface 5 carry out the opening of the gap 4 mostly, it makes and provides, and the conventional thin film magnetic head 1 is formed, as shown in drawing 4.
[0003]On the base 6 made from the ceramics of an AlTiC system, by thin-film-forming methods, such as sputtering process, the insulating layer 7, the lower magnetic layer 8, the winding 9, the upper magnetic layer 10, and the protective layer 11 are laminated in order, and this thin film head element 3 is formed, as shown in drawing 5. Both the raw materials that form the lower magnetic layer 8 and the upper magnetic layer 10 are permalloys, the raw material of the winding 9 is copper and the opposing part of both the magnetic layers 8 and 10 in which this winding 9 is allocated is filled up with the insulating members 11, such as resin. The tip part has countered via GYAPU 4, and as the winding 9 goes the connecting part of said both magnetic layers 8 and 10 around, both the magnetic layers 8 and 10 are formed while the part is connected. The insulating layer 7 and the protective layer 11 are formed of aluminum2O3 etc.
[0004]As a raw material of said base 6, raw materials glass, SiO2, and aluminum2O3, various ferrites, and various [various] with are used besides ceramic raw materials, such as an AlTiC system mentioned above. And in forming the lower magnetic layer 8 on this base 6 by using ceramic raw materials, such as an AlTiC system, as the base 6 especially. As mentioned above, the lower magnetic layer 8 is not directly formed on the base 6, It provides on the base 6 by using the insulating layers 7, such as SiO2 and aluminum2O3, as a ground film, and making the lower magnetic layers 8, such as a permalloy, form by thin-film-forming methods, such as sputtering process, on this insulating layer 7 is generally performed.
[0005]At the time of the thin film forming of the lower magnetic layer 8 of the conventional thin film magnetic head 1, the base 6 is warmed at about 300 **, and is performed. This is for making the magnetic properties as the thin film magnetic head 1 optimize.
[0006]Improvement in productivity and reduction of an economic burden are taken into consideration, and the thin film head element 3 is not **(ed) individually, but forms many thin film head elements 3 in the big base 6 with a wafer form of 3 inches simultaneously, and is started with the proper cutting device, for example.
[0007]In the thin film magnetic head 1 currently formed in this way, by energizing to the winding 9, said gap 4 portion is made to generate magnetic flux, information is recorded to a magnetic recording medium, and information is reproduced by making the winding 9 interlink the magnetic flux of a magnetic recording medium at the time of reproduction at the time of record.
[0008]
[Problem(s) to be Solved by the Invention]However, in the conventional thin film magnetic head 1 using the ceramic raw material mentioned above as the base 6, By warming the base 6 at about 300 ** at the time of the thin film forming by sputtering process, the large stress of about 500 MPa arose in the lower magnetic layer 8 of the thin film head element 2, for example, and exfoliation of the lower magnetic layer 8 and modification of the thin film head element 2 occurred in it, and it had a problem that quality was not stabilized.
[0009]While the stress committed to the thin film head element 2 makes dispersion in the direction of an anisotropy axis of the thin film head element 2 increase, When

you made it magnetized, dispersion in the direction of an anisotropy axis increased more according to the inverse magnetostrictive effect, the output characteristics at the time of considering it as the thin film magnetic head 1 were reduced, and there was a problem that the quality where the Uighur noise was occurred and stabilized further was not acquired.
[0010]When transparent aluminum2O3 etc. were used as the insulating layer 7, while the heat energy of the base 6 will be released by radiation through the insulating layer 7, the heating rate of the base 6 became small and thin film forming took the long time, there was a problem that productive efficiency fell.
[0011]This invention is made in view of these points, and is a thing.
the purpose is in the state where conquered the problem in ** and the optimal magnetic properties were made to hold, and is providing the thin film magnetic head which prevented generating of a Uighur noise, and exfoliation of a magnetic layer and where quality was stabilized.

[0012]
[Means for Solving the Problem]In order to attain the purpose mentioned above a thin film magnetic head of this invention, It is characterized by forming on a base an insulating layer which at least one light of ultraviolet radiation, visible light, and infrared light penetrates, and forming a metal membrane between said base and an insulating layer in a thin film magnetic head which forms a magnetic layer on said insulating layer.
[0013]
[Function]Since the metal membrane formed between the base and the insulating layer can be made to prevent radiation of the accumulation of heat energy, and heat according to the thin film magnetic head of this invention which consists of composition mentioned above, Where temperature given to a base at the time of the thin film forming of the lower magnetic layer by sputtering process is made into low temperature, the optimal magnetic properties can be acquired, the stress of a thin film magnetic head can be decreased, and inconvenience, such as exfoliation of a lower magnetic layer and generating of a Uighur noise, can be removed certainly.
[0014]
[Example]Hereafter, the example of this invention is described about drawing 3 from drawing 1.
[0015]Drawing 1 shows the important section of one example of the thin film magnetic head of this invention, and has given identical codes to the conventional example and identical parts which were mentioned above.
[0016]In the thin film magnetic head 13 of this example, the metal membrane 14 which consists of copper stock is made to be placed between the surfaces by the side of the insulating layer 7 of the base 6, it is formed in them, and other composition is the same as that of the former.
[0017]Explanation will form copper stock in at least one surface of the wafer form base 6 which consists of a ceramic raw material of an AlTiC system as the metal membrane 14 which has metallic luster about 0.1 micrometer thick by publicly known thin-film-forming methods, such as plating, electrodeposition, or sputtering. After that, the insulating-layer 7 grade made from aluminum2O3 is formed as usual.
[0018]As the metal membrane 14, radiation of the heat from the base 6 to the formation side surface of the lower magnetic layer 8 can be prevented in the temperature up of the base 6 at the time of membrane formation of the lower magnetic layer 8, What is necessary is just to be a metal material with the sufficient temperature retention characteristic of the base 6 which carried out temperature up to prescribed temperature, metal materials, such as Au, Ti, Nb, and Cr, may be sufficient, and it is not limited in particular to this example. As for the thickness of the metal membrane 14, it is desirable to consider it as the grade which has metallic luster uniform at least. When this is too thin, the metal membrane 14 is because a porous next door and various problems of adhesion with the insulating layer 7 deteriorating if too thick arise.
[0019]And thin-film-forming methods, such as sputtering, are used for the surface of the insulating layer 7 for the lower magnetic layer 8, and the temperature of the base 6 under membrane formation is made to form as low temperature, for example, about 250 **, conventionally.
[0020]Thus, an operation and various kinds of characteristics of the thin film magnetic head 13 of this example currently formed are explained about drawing 2 and

drawing 3.
[0021]First, according to the thin film magnetic head 13 of this example which consists of composition mentioned above. When forming the lower magnetic layer 8 with thin-film-forming methods, such as sputtering, while the metal membrane 14 can carry out accumulation of the heat energy at the time of the temperature up of the base 6, The heat energy radiated from the formation side surface of the lower magnetic layer 8 of the base 6 can be decreased, and the heating up time of the base 6 can be shortened. And in the case where temperature of the base 6 under membrane formation is conventionally made into low temperature, for example, 250 **, Heat energy is supplied from the metal membrane 14 side promptly without an intermission to the initial growth phase of the lower magnetic layer 8 formed in the surface of the insulating layer 7, and the lower magnetic layer 8 which has the suitable magnetic properties for the thin film magnetic head 13 can be made to form.
[0022]Since cooking temperature of the base 6 can be made into low temperature (250 **) conventionally (300 **), the stress which remains to the lower magnetic layer 8 of the thin film head element 3 can be reduced to about about 1 of the former (500MPa) / three to 1/2.If the stress of this lower magnetic layer 8 declines, while being able to prevent exfoliation of the lower magnetic layer 8, and modification of the thin film head element 3, dispersion in the direction of an anisotropy axis resulting from the stress and the inverse magnetostrictive effect of the thin film head element 3 can be reduced, and generating of a Uighur noise can be prevented.
[0023]Drawing 2 is a magnetic hysteresis loop which shows the magnetic properties (relation between a magnetic field and magnetic flux density) of the lower magnetic layer 8 of the thin film magnetic head 13 when the base 6 is used as AlTiC ceramic raw material and it uses the insulating layer 7 as aluminum2O3 raw material, The lower magnetic layer 8 of the thin film magnetic head 13 of this example which has the metal membrane 14 using copper stock when the figure inner substance line made 250 ** temperature of the base 6 at the time of manufacture of the lower magnetic layer 8, and the broken chain line in a figure For comparison. . Created on the same conditions as this example, without forming the metal membrane 14 in some wafer form bases 6 at the time of manufacture of the thin film magnetic head 13 of this example. The lower magnetic layer 8 of the straw-man thin film magnetic head 13a which does not have the metal membrane 14, and the figure destructive line show the lower magnetic layer 8 of the conventional thin film magnetic head 1 which does not have the metal membrane 14 which made temperature of the base 6 at the time of creation of the lower magnetic layer 8 300-degree Centigrade.
[0024]From this drawing 2, when the thin film magnetic head 13 of this example which has the metal membrane 14 made low temperature conventionally temperature of the base 6 at the time of membrane formation of the lower magnetic layer 8, it became clear that the same magnetic properties as the conventional thin film magnetic head 1 could be held. When the straw-man thin film magnetic head 13a which does not have the metal membrane 14 made low temperature conventionally temperature of the base 6 at the time of membrane formation of the lower magnetic layer 8, it became clear that magnetic properties became inferior.
[0025]Drawing 3 is a diagram showing the output characteristics of a thin film magnetic head, (a) is a diagram showing the output characteristics of the thin film magnetic head 13 which has the metal membrane 14 of this example, and (b) is a diagram showing the output characteristics of the conventional thin film magnetic head 1 which does not have the metal membrane 14.
[0026]If drawing 3 (a) is compared with drawing 3 (b), as shown in drawing 3 (a), the thin film magnetic head 13 of this example which has the metal membrane 14, in the case where temperature of the base 6 at the time of creation of the lower magnetic layer 8 is conventionally made into low temperature -- generating of a Uighur noise -- there is nothing (inside of 20 samples zero piece) -- it became clear that it was a quality thin film magnetic head. On the other hand, as shown in drawing 3 (b), what (inside of 20 samples two pieces) a Uighur noise as shown by a figure Nakaya seal generates for the conventional thin film magnetic head 1 which does not have the metal membrane 14 became clear. In the straw-man thin film magnetic head 13a which does not have the metal membrane 14 which made low temperature conventionally temperature of the base 6 at the time of membrane formation of the lower magnetic layer 8, still more (inside of 20 samples 12 pieces) said Uighur noises than the conventional thin film magnetic head 1 occur.
[0027]Thus, where magnetic properties are held to an optimum state by making the

metal layer 14 intervene between the base 6 and the transparent insulating layers 7, such as aluminum2O3, Temperature of the base 6 at the time of membrane formation of the lower magnetic layer 8 can be conventionally made into low temperature, and ** can obtain the quality magnetic head which removed the Uighur noise by being stabilized.
[0028]Temperature of the base 6 at the time of membrane formation of the lower magnetic layer 8 can be conventionally made into low temperature, membrane formation time including the rising-and-falling-temperature time of the base 6 can be further shortened compared with the former according to radiation preventive effects, such as heat energy from the base 6 by the metal membrane 14, and productive efficiency can be raised.
[0029]This invention is not limited to said example and can be changed if needed.
[0030]
[Effect of the Invention]Since the thin film magnetic head of this invention is constituted and acts, as explained above, while being able to prevent certainly exfoliation of a lower magnetic layer, modification of a thin film head element, and generating of a Uighur noise, It is quality and the extremely outstanding effect, like the thin film magnetic head which was excellent in reliability can be obtained is done so.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]Drawing of longitudinal section of an important section showing one example of the thin film magnetic head of this invention
[Drawing 2]The magnetic hysteresis loop which shows the magnetic properties of the relation between a magnetic field and magnetic flux density
[Drawing 3]a and b are the diagrams showing the output characteristics of the thin film magnetic head in this invention and a conventional example.
[Drawing 4]The perspective view of an important section showing the conventional whole thin film magnetic head
[Drawing 5]The partial expanded sectional view of the important section of drawing 4

[Description of Notations]
6 Base
7 Insulating layer
8 Lower magnetic layer
13 Thin film magnetic head
14 Metal membrane

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1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

[Drawing 1]

[Drawing 2]

[Drawing 4]

[Drawing 3]

[Drawing 5]

[Translation done.]